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10/674,604	09/30/2003	Jimmie Earl DeWitt JR.	AUS920030478US1	4478

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EXAMINER	
FIEGLE, RYAN PAUL	
ART UNIT	**PAPER NUMBER**
2183	

DATE MAILED: 05/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/674,604	DEWITT ET AL.	
	Examiner	Art Unit	
	Ryan P. Fiegle	2183	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/9 1/30 2/14 4/21*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The amendments to the specification are acknowledged and accepted; the examiner confirms they introduced no new matter.

Claim Objections, Claim Rejections - 35 USC § 112 and 35 USC § 101

1. The examiner acknowledges and accepts the amendments to resolve the objection and 112 issues.

2. The examiner gratefully acknowledges the effort of the applicant to speed prosecution by eliminating the non-statutory material from the specification; this resolves the 101 issue.

Double Patenting

3. The examiner agrees that the claims referred to in the statutory double patenting rejection are merely non-statutory double patenting, which is remedied by the terminal disclaimer submitted by the applicant.

4. The terminal disclaimer filed on 4/21/06 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of any patent granted on Application Numbers 10/675776 and 10/675777 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Response to Arguments

5. The applicant has made the following argument:

> "Thus, the watchpoint indications in Pardo, are not events associated with execution of an instruction and subsequent instructions as required in claim 1, but identify when instructions are fetched from a memory address."

Pardo column 2, lines 17-29 state:

> "The history buffer stores the state values for an instruction until a predetermined time when that instruction is either retired or flushed. The watchpoint information associated with a particular watchpoint is also stored in the history buffer in association with the processor state values such that the processor state is changed and the watchpoint is announced at a predetermined time. In one embodiment of the present invention, the predetermined time is when an instruction and all preceding instructions have been completed, which is the time that an instruction is retired from the history buffer. If an executed instruction is canceled before it is completed, preferably the watchpoint information is removed from the history buffer and is not announced."

If Pardo's watchpoints were merely associated with when the instruction was fetched, why would they not be counted until after they are executed? The watchpoints are simply *set* at instruction fetching, but are associated with the execution of the instruction. The watchpoint of a current instruction will affect subsequent instructions because the count is not discarded after the watchpoint but kept for future watchpoints.

6. The applicant has made the following argument:

> "Even if the Examiner's assertion is correct that 'execution of the instruction,' and 'time needed to execute the instruction' are events, Pardo does not disclose that such events are counted."

The examiner does not "assert" that "execution of the instruction" and "time needed to execute the instruction" are events, the applicants states that they are in claim 3. If the applicant does not agree, the best mode requirement may not have been fulfilled.

The watchpoints are not counted until retirement, which inherently means that the instruction executed. The time taken for execution will also be known since, as

noted above, the watchpoints are set at fetch. The time from fetch to retirement is the time to execute.

7. The applicant has made the following argument:

> "The subject matter of claims 4 and 5 is also not disclosed in Pardo. As noted by the Examiner, when the watchpoint counter in Pardo counts down to zero, a breakpoint signal is generated to initiate an exception routine (see col. 8, lines 39-46. This is not the same as 'receiving another instruction after receipt of the instruction, wherein the another instruction is associated with the indicator'; and 'halting receipt counting of the events associated with the execution of the instruction and subsequent instructions in response to receiving the another instruction associated with the indicator' as recited in claim 4..."

Similar arguments are made in respect to claim 5.

The breakpoint is associated with an instruction (column 8, lines 7-11) which is received after the instruction that is associated with a watchpoint that made the counter go to zero. The breakpoint will halt execution and thus will halt counting.

8. The applicant has made the following argument:

> "Pardo is not concerned with counting events associated with data accesses..."

As noted in section 31 of the previous office action, Edwards states that setting watchpoints for instructions can be difficult and therefore setting watchpoints for data accesses can be desirable (Edwards: column 1, lines 26-33). This is motivation to combine Pardo and Edwards.

9. All other arguments relate to the ones discussed above. Therefore, all claims are rejected as stated in the previous office action and presented below as reference.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5, 8, 9, 11, 19-21 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Pardo et al. (US Patent 5,754,839).

3. As per claim 1:

A method in a data processing system for processing instructions, the method comprising:

responsive to receiving an instruction at a processor in the data processing system, determining whether an indicator is associated with the instruction (column 2, lines 7-13); and

counting events associated with execution of the instruction and subsequent instructions if the indicator is associated with the instruction (column 2, lines 33-37).

4. As per claim 2:

The method of claim 1, wherein the counting step comprises:

sending a signal to a performance monitor unit in the processor in response to determining that the indicator is associated with the instruction (column 4, lines 52-59; column 5, lines 38-49); and

counting the events associated with execution of the instruction and subsequent instructions using the performance monitor unit (column 6, lines 6-13).

5. As per claim 3:

The method of claim 1, wherein an event includes at least one of an entry into a module, an exit from a module, an entry into a subroutine, an exit from a subroutine, an

entry into a function, starting of input/output, completion of input/output, execution of the instruction, and time needed to execute the instruction (column 5, lines 11-14; column 6, lines 2-6) (Instructions that are associated with watchpoints are executed. This fulfills the limitations of "execution of the instruction," and "time needed to execute the instruction," since it is inherent that the processor will be provided time to execute the instruction properly. Since the claim is written so that an event includes "at least one of..." the limitations are in the alternative and only one needs to be met to fulfill the limitations of the claim.).

6. As per claim 4:

The method of claim 1 further comprising:

receiving another instruction after receipt of the instruction, wherein the another instruction is associated with the indicator (column 7, lines 66-67; column 8, lines 1-2); and

halting counting of the events associated with the execution of the instruction and subsequent instructions in response to receiving the another instruction associated with the indicator (column 8, lines 2-11) (A breakpoint will halt counting).

7. As per claim 5:

The method of claim 1, wherein the indicator is a first type of indicator and further comprising:

receiving another instruction after receipt of the instruction, wherein the another instruction is associated with a second type of indicator (column 7, lines 66-67; column

8, lines 1-11) (When the instruction associated with the watchpoint triggers a breakpoint, the breakpoint is also associated with the instruction.); and

halting counting of the events associated with the execution of the instruction and subsequent instructions in response to receiving the another instruction associated with the second type of indicator (column 8, lines 2-11).

8. As per claim 8:

The method of claim 1, wherein the indicator associated with the instruction is located in a shadow memory (column 6, lines 2-6) (A history buffer is a shadow memory since it holds state information for architectural locations.).

9. As per claim 9:

The method of claim 1, wherein the instruction is received in a bundle and wherein the indicator comprises at least one spare bit in the bundle (column 5, lines 51-66).

10. As per claim 11:

The method of claim 1, wherein an event in the events includes at least one of an entry into a module, an exit from a module, an entry into a subroutine, an exit from a subroutine, an entry into a function, starting of input/output, completion of input/output, and the execution of the instruction (column 5, lines 11-14; column 6, lines 2-6) (Instructions that are associated with watchpoints are executed. This fulfills the limitations of "execution of the instruction." Since the claim is written so that an event includes "at least one of..." the limitations are in the alternative and only one needs to be met to fulfill the limitations of the claim.).

11. As per claims 19-21:

Claims 19-21 recite the system for performing the method of claims 1-3. Pardo et al. disclose a system to perform their method (Figure 2). Therefore, claims 19-21 are rejected for the same reasons as claims 1-3.

12. As per claim 24:

While Pardo et al. do not explicitly disclose a computer program product in a computer readable medium for the execution of his method (column 2, lines 7-37), such is inherently present since it would be impossible to execute the method unless it was embodied on some form of computer readable medium. Therefore, claim 24 is rejected for the same reasons as claim 1.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 12-14, 16, 17, 22, 23 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. (US Patent 5,754,839) in view of Edwards et al. (US Patent 6,378,064).

15. As per claim 12:

Pardo et al. teach counting events associated with instructions (Pardo et al.: column 2, lines 7-13).

Pardo et al. does not teach counting events associated with data accesses.

Edwards et al. teach a method in a data processing system for monitoring access to data, the method comprising:

responsive to receiving data at a processor in the data processing system, determining whether an indicator is associated with the data (Edwards et al.: column 16, lines 33-37).

Edwards et al. comment that setting watchpoints for instructions can be difficult to implement; therefore, setting watchpoints for data accesses can be desirable (Edwards et al.: column 1, lines 26-33).

Therefore, it would have been obvious to one of ordinary skill in the pertinent art at the time of the applicant's invention that applying Edwards et al. to Pardo et al. would alleviate the difficulties associated with setting watchpoints solely based on instructions.

16. As per claim 13:

The method of claim 12 further comprising: halting counting of events associated with accesses to the data when the indicator is associated with the data is encountered a second time (Pardo et al.: column 7, lines 66-67; column 8, lines 1-11) (The watchpoint counters can be set to watch for two events before a breakpoint occurs, halting the counting.).

17. As per claim 14:

The method of claim 12 further comprising: halting counting of events associated with accesses to the data when a different indicator associated with the data is encountered (Pardo et al.: column 7, lines 66-67; column 8, lines 1-11) (When the instruction

associated with the watchpoint triggers a breakpoint, the breakpoint is also associated with the instruction in Pardo. This would remain true when Edwards et al. is applied to Pardo et al. and the watchpoints are used for data as well.).

18. As per claim 16:

The method of claim 12, wherein the data is in one of a memory location or a range of memory locations (Though it is not disclosed explicitly in Edwards et al., it is inherent that a range of addresses will be associated with a watchpoint in certain instances. For example, for floating point instructions that use floating-point 64-bit operands, the watchpoint will cover the range of two addresses.).

19. As per claim 17:

The method of claim 12, wherein an event in the events includes at least one of the access to the memory location (Edwards et al.: column 16, lines 33-37).

20. As per claim 22:

Claim 22 is the system for performing the method of claim 12. Pardo et al. and Edwards et al. disclose systems for performing their methods (Pardo et al.: Figure 2) (Edwards et al.: Figure 13). When the two references are combined, this would remain true. Therefore, claim 22 is rejected for the same reasons as claim 12.

21. As per claim 23:

Claim 23 is the system for performing the method of claim 17. Pardo et al. and Edwards et al. disclose systems for performing their methods (Pardo et al.: Figure 2) (Edwards et al.: Figure 13). When the two references are combined, this would remain true. Therefore, claim 23 is rejected for the same reasons as claim 17.

22. As per claim 25:

While Pardo et al. can teach a computer program product in a computer readable medium as claimed in 24 as discussed above, Pardo can not teach the limitations of claim 25 because Pardo does not teach watchpoints associated with data accesses. However, as was shown above, there is motivation to apply Edwards et al. to Pardo et al. to modify Pardo's method to include memory accesses. It would have been obvious to one of ordinary skill in the pertinent art at the time of the applicant's invention that when modifying Pardo's method to include memory accesses, that this would also include modifying the computer program product containing instructions to execute the method.

23. Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. (US Patent 5,754,839) as applied to claim 1 and in view of Betker et al. (USPGPub 2003/0154463).

24. Pardo et al. teach claim 1 for the reason listed above.

25. As per claim 6:

Pardo et al. do not teach receiving their watchpoints from an instruction cache. Instead, the watchpoints are generated from the I-bus support logic (Pardo et al.: Figure 2, item 10) based on user-programmed rules using comparators. Using the signals from the I-bus support logic, the performance monitor counts events based on watchpoints associated with execution of an instruction and subsequent instructions.

Betker et al. teach sending a signal to a performance monitor unit from an instruction cache (Betker et al.: Abstract).

Betker et al. comment that keeping the indicators in the instruction cache and transmitting them to the performance monitor unit from the instruction cache allows for processors in a multiprocessor system to execute breakpoint code even when one processor has continued from the breakpoint.

Therefore, it would have been obvious to one of ordinary skill in the pertinent art at the time of the applicant's invention that applying Betker et al. to Pardo et al. would give Pardo et al. the benefit of being able to allow processors execute breakpoint code even when one processor has already continued from the breakpoint in a multiprocessor system.

26. As per claim 18:

Claim 18 recites the same limitations as claim 6 and is therefore rejected for the same reasons.

27. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. (US Patent 5,754,839) as applied to claim 1 and in view of (Chrysos et al.: US Patent 6,163,840).

28. Pardo et al. teach claim 1 for the reason listed above.

29. As per claim 7:

Pardo et al. do not teach the method of claim 1, wherein the indicator is located in a field in the instruction, which Chrysos et al. do (Chrysos et al.: column 13, lines 36-42).

Chrysos et al. comment that the use of the S bit field in the instruction reduces the overhead of profiling by restricting the number of instructions that are profiled (Chrysos et al.: column 14, lines 20-22).

Therefore, it would have been obvious to one of ordinary skill in the pertinent art at the time of the applicant's invention that applying Chrysos et al. to Pardo et al. would reduce the overhead of profiling by reducing the number of instructions that are profiled.

30. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. (US Patent 5,754,839) as applied to claim 1 above in view of Betker et al. (USPGPub 2003/0154463) and Legvold et al. (US Patent 5,404,500).

31. As per claim 10:

As was shown above in reference to claim 6, Pardo et al. has motivation to keep the indicators associated with instructions in an instruction cache based on the teachings of Betker et al.

However, Pardo et al. in combination with Betker et al. can not teach the method of claim 1, wherein the indicator is located in a shadow cache.

Legvold et al. teach a shadow cache (Legvold et al.: column 5, lines 56-58).

Legvold et al. comment that their shadow caches provide the advantage of backing up data on a cache failure that is an improvement on the prior art (Legvold et al.: column 3, lines 37-47).

Therefore, it would have been obvious to one of ordinary skill in the pertinent art to apply Legvold to Pardo et al. in combination with Betker et al. to provide back up of data in the instance that Betker's cache fails.

It is inherent that since Legvold's shadow cache mirrors the regular cache that Betker's indicators will be present in Leghold's shadow cache when applied to Pardo et al.

32. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pardo et al. (US Patent 5,754,839) in combination with Edwards et al. (US Patent 6,378,064) as applied to claim 12 in further view of (Chrysos et al.: US Patent 6,163,840).

33. Pardo et al. in combination with Edwards et al. teach the limitations of claim 12 for the reasons listed above.

34. As per claim 15:

Pardo et al. do not teach the method of claim 1, wherein the indicator is located in a field in the instruction which Chrysos et al. do (Chrysos et al.: column 13, lines 36-42).

Chrysos et al. comment that the use of the S bit field in the instruction reduces the overhead of profiling by restricting the number of instructions that are profiled (Chrysos et al.: column 14, lines 20-22).

When Pardo et al. is combined with Edwards et al. for watchpoints of data accesses, Chrysos' S bit field would provide the same advantages if it was applied to data addresses as well as instructions.

Therefore, it would have been obvious to one of ordinary skill in the pertinent art at the time of the applicant's invention that applying Chrysos et al. to Pardo et al. would reduce the overhead of profiling by reducing the number of instructions and data accesses that are profiled.

Conclusion

35. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan P. Fiegle whose telephone number is 571-272-5534. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on 571-272-4162. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ryan P Fiegle
Examiner
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